

## Nano-Particle Scandate Cathode for Space Communications Phase II

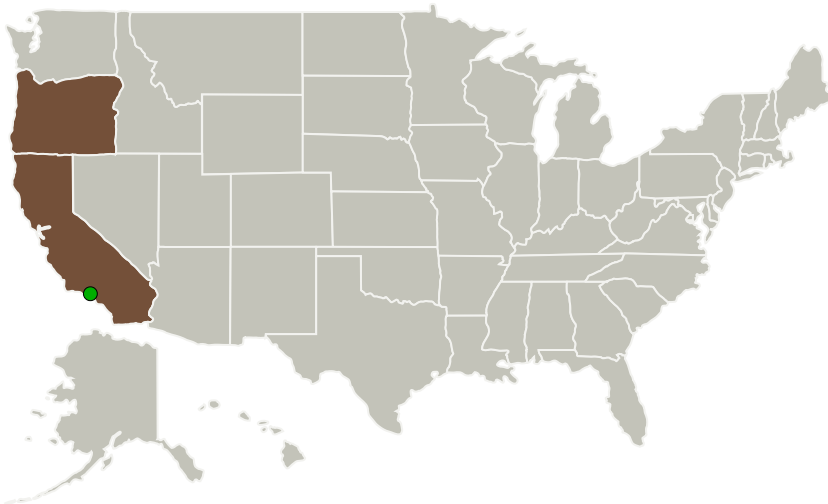


Completed Technology Project (2011 - 2013)

## Project Introduction

We propose an improved cathode based on our novel theory of the role of scandium oxide in enhancing emission in tungsten-impregnated cathodes. Recent results have demonstrated the efficacy of nano-particle scandium oxide, but a detailed theory on the mechanism of operation has been lacking. Our theory explains published data and points to an optimized cathode, which we propose here to build and test. The cathode is the performance-limiting component in high-frequency linear beam amplifiers such as traveling wave tubes and klystrons. The required bandwidth, data rate, number of channels, frequency, and output power are going up. The performance of linear beam amplifiers is acutely limited by current cathode performance. Scandate cathodes offer a way to increase top emission from 10 A/cm<sup>2</sup> to at least 50 A/cm<sup>2</sup>. Phase I proved the feasibility of applying layers on unagglomerated scandium oxide on impregnated cathodes. Phase II will optimize, test, and commercialize the process.

## Primary U.S. Work Locations and Key Partners



Nano-Particle Scandate Cathode  
for Space Communications  
Phase II

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## Nano-Particle Scandate Cathode for Space Communications Phase II



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Organizations Performing Work	Role	Type	Location
e-beam, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Beaverton, Oregon
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

## Primary U.S. Work Locations

California	Oregon
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## Project Transitions

**June 2011:** Project Start**November 2013:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/139270>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

e-beam, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

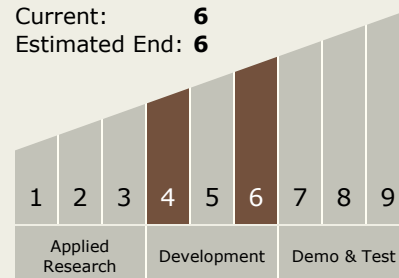
Carlos Torrez

**Principal Investigator:**

Bernard K Vancil

## Technology Maturity (TRL)

Start: 4  
Current: 6  
Estimated End: 6



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## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.2 Power-Efficiency

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System